

# **DOWNHOLE VIBRATION MONITORING & CONTROL SYSTEM QUARTERLY PROGRESS REPORT #16**

Starting date: July 1, 2006

Ending Date: September 30, 2006

Principal Author: Martin E. Cobern

Date Issued: October 19, 2006

DOE Award Number: DE-FC26-02NT41664

Submitting Organization APS Technology, Inc.  
800 Corporate Row  
Cromwell, CT 06416

## **DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **ABSTRACT**

The objective of this program is to develop a system to both monitor the vibration of a bottomhole assembly, and to adjust the properties of an active damper in response to these measured vibrations. Phase I of this program, which entailed modeling and design of the necessary subsystems and design, manufacture and test of a full laboratory prototype, was completed on May 31, 2004.

The principal objectives of Phase II were: more extensive laboratory testing, including the evaluation of different feedback algorithms for control of the damper; design and manufacture of a field prototype system; and, testing of the field prototype in drilling laboratories and test wells. Phase II concluded on January 31, 2006, and the final report was issued.

Work on Phase III of the project began during the previous quarter. Efforts this quarter have focused on the manufacture of the prototype and precommercial parts, field test planning and commercialization.

The current extreme lead times quoted by oilfield machine shops for collar components, will delay the deployment of the field prototypes. The delivery date for five critical parts from one supplier has slipped to late November, which will preclude deployment for a field test before late December or early January. We are exploring whether we can take the partially made parts and complete them earlier in our own shop.

## Table of Contents

Executive Summary .....	4
Design.....	5
Redesign of laboratory prototype .....	5
Design of feedback system .....	5
Intermediate prototype design.....	5
Design of field prototype tool.....	5
Design of precommercial prototype tool .....	5
Experimental .....	5
Retesting of DVMCS prototype .....	5
Preparations for Testing at TerraTek.....	5
Testing at TerraTek Drilling Laboratory .....	5
Field Testing.....	5
Analysis .....	6
TerraTek data.....	6
Commercialization .....	6

## **Executive Summary**

The objective of this program is to develop a system to both monitor the vibration of a bottomhole assembly, and to adjust the properties of an active damper in response to these measured vibrations. Phase I of this program, which entailed modeling and design of the necessary subsystems and design, manufacture and test of a full laboratory prototype, was completed on May 31, 2004.

The principal objectives of Phase II were: more extensive laboratory testing, including the evaluation of different feedback algorithms for control of the damper; design and manufacture of a field prototype system; and, testing of the field prototype in drilling laboratories and test wells. Phase II concluded on January 31, 2006, and the final report was issued.

Work on Phase III of the project began during the previous quarter. Efforts this quarter have focused on the manufacture of the prototype and precommercial parts, field test planning and commercialization.

The current extreme lead times quoted by oilfield machine shops for collar components, will delay the deployment of the field prototypes. The delivery date for five critical parts from one supplier has slipped to late November, which will preclude deployment for a field test before late December or early January. We are exploring whether we can take the partially made parts and complete them earlier in our own shop.

## Design

### ***Redesign of laboratory prototype***

COMPLETE.

### ***Design of feedback system***

COMPLETE.

### ***Intermediate prototype design***

COMPLETE

### ***Design of field prototype tool***

COMPLETE

While key parts were ordered as soon as their designs were frozen, the present boom in oil & gas drilling has created long lead times at shops building BHA components. As a result, one key item now has a delivery date of September 28, which will prevent the completion of the prototype by the end of Q3. [**Note:** After the end of Q3, the delivery date for five key components slipped into November.]

### ***Design of precommercial prototype tool***

The precommercial prototype was essentially complete at the end of this quarter, and the parts have all been ordered. Some small modifications may be made, based on the results of early field tests.

## Experimental

### ***Retesting of DVMCS prototype***

COMPLETE

### ***Preparations for Testing at TerraTek***

COMPLETE

### ***Testing at TerraTek Drilling Laboratory***

COMPLETE.

### ***Field Testing***

We have been talking to RMOTC and are planning to do the first field test there, if a mutually agreeable schedule can be developed. If not, two major production companies have expressed interest in testing the tool on commercial wells.

## **Analysis**

### ***TerraTek data***

COMPLETE.

## **Commercialization**

We have been speaking to three oilfield service/supply companies about commercializing the DVMCS. One of these seems nearly ready to commit, pending resolution of the patent questions with Sandia Laboratories. At the end of the quarter, discussions with Sandia on licensing and/or joint efforts were underway.

Discussions have begun with two major oil companies who have expressed an interest in using the DVMCS on their commercial wells.

## Units

To be consistent with standard oilfield practice, English units have been used in this report. The conversion factors into SI units are given below.

1 ft.	=	0.30480 m
1 g	=	9.82 m/s
1 in.	=	0.02540 m
1 klb.	=	4448.2 N
1 lb.	=	4.4482 N
1 rpm	=	0.01667 Hz
1 psi	=	6984.76 Pa